

status report from Shinshu- toward the scecal beam test at DESY

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Sep2020 for CALICE meetsng

Shinshu contribution to the scale beam test at DESY

Preparation of two EBU's

Bottom and Center read out EBU

1

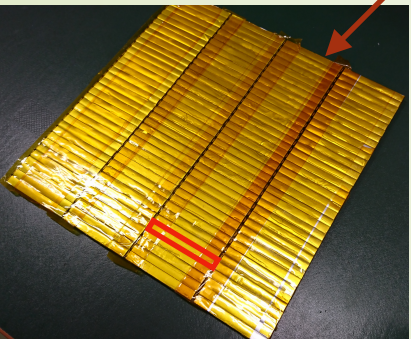
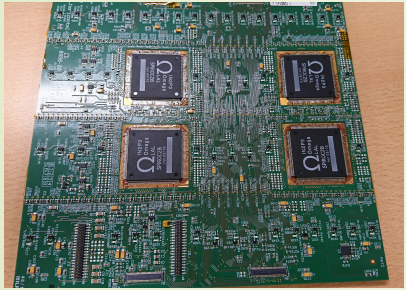
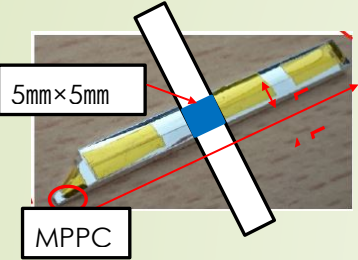
ECAL Technological prototype

2

Scintillator Electro-Magnetic CALorimeter : scECAL

Scintillator strip : sensor with tungsten absorber
++ embedded readout electronics (EBU)

Orthogonal setting of sc-strips gives 5mm x 5mm resolution

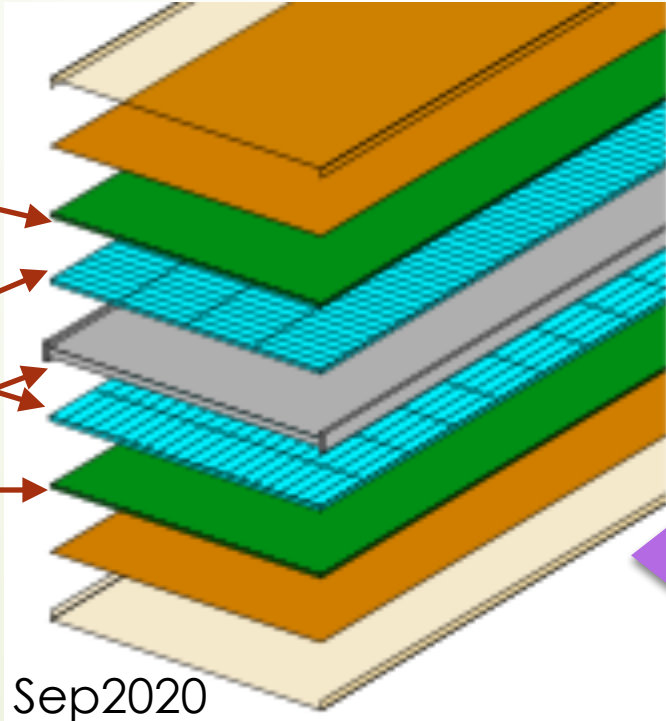


EBU

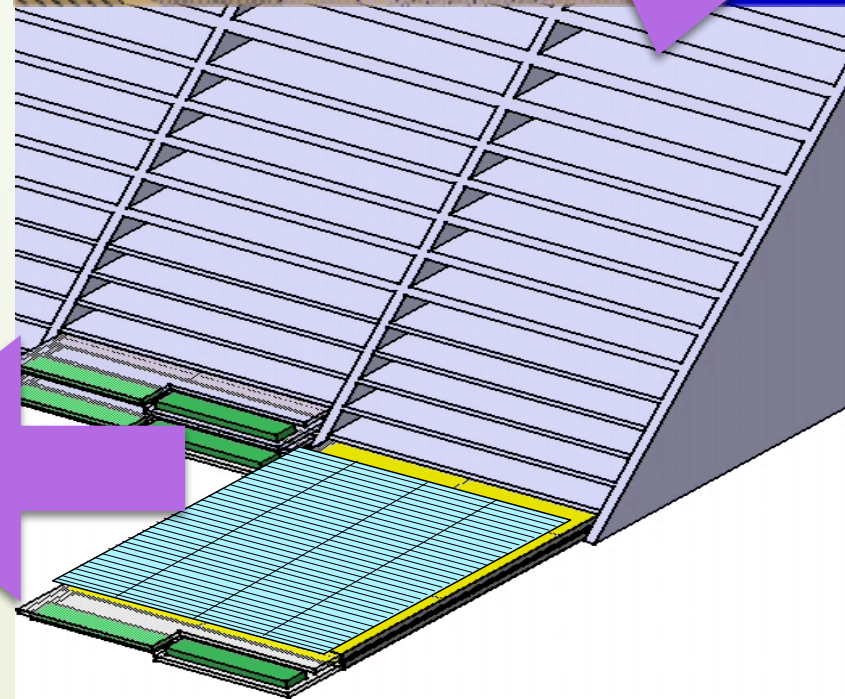
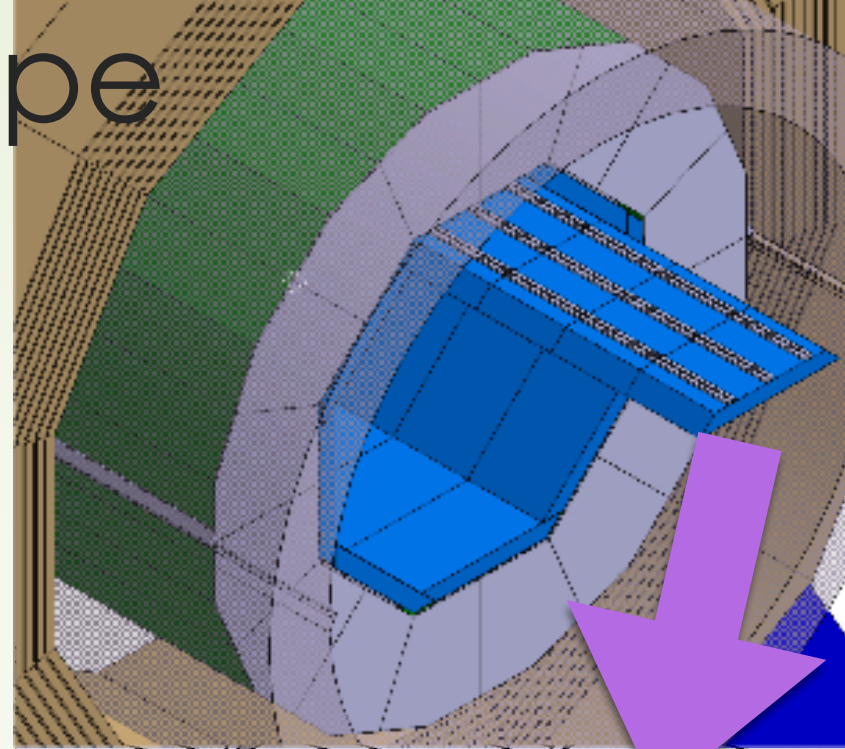
Scintillator strip

Tungsten abs.

EBU



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EBU = ECAL Base Unit by DESY

18cm x 18cm < 5mm/layer

144 sc-strips and MPPCs

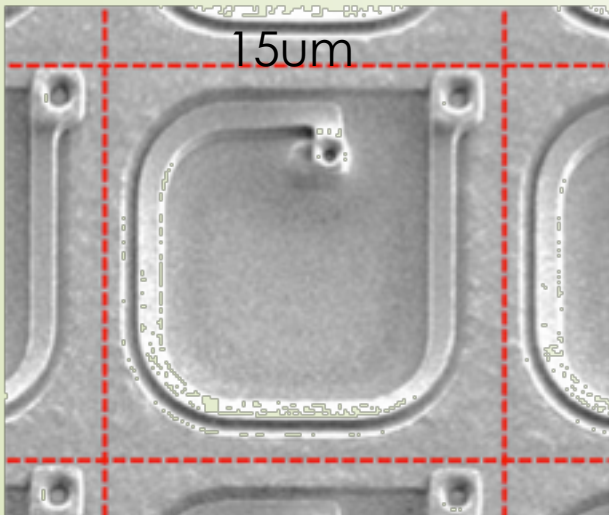
Front end electronics = SPIROC2b ASIC (Ω)

- MPPC signal will be amplified, stored in analog memory and digitized in SPIROC then read out

- Gains, thresholds and timing control

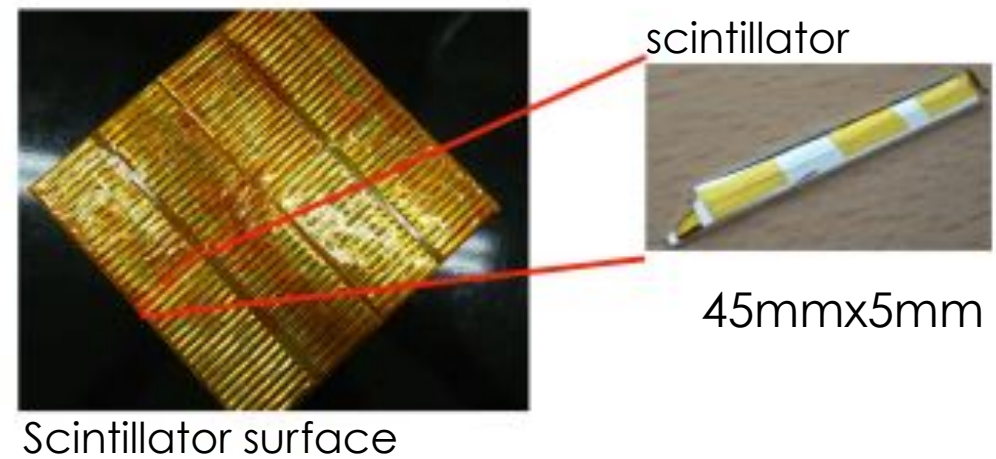
- LED calibration capability for p.e. gain

● **Fill factor: 49%** Bias control, monitor



Sc-strip = 5x45x2mm³
 trench
 Bottom read out and Center
 read out by a MPPC
 S14160-1315P
 15um pitch (~7500 pixels in
 1.3x1.3 mm²)

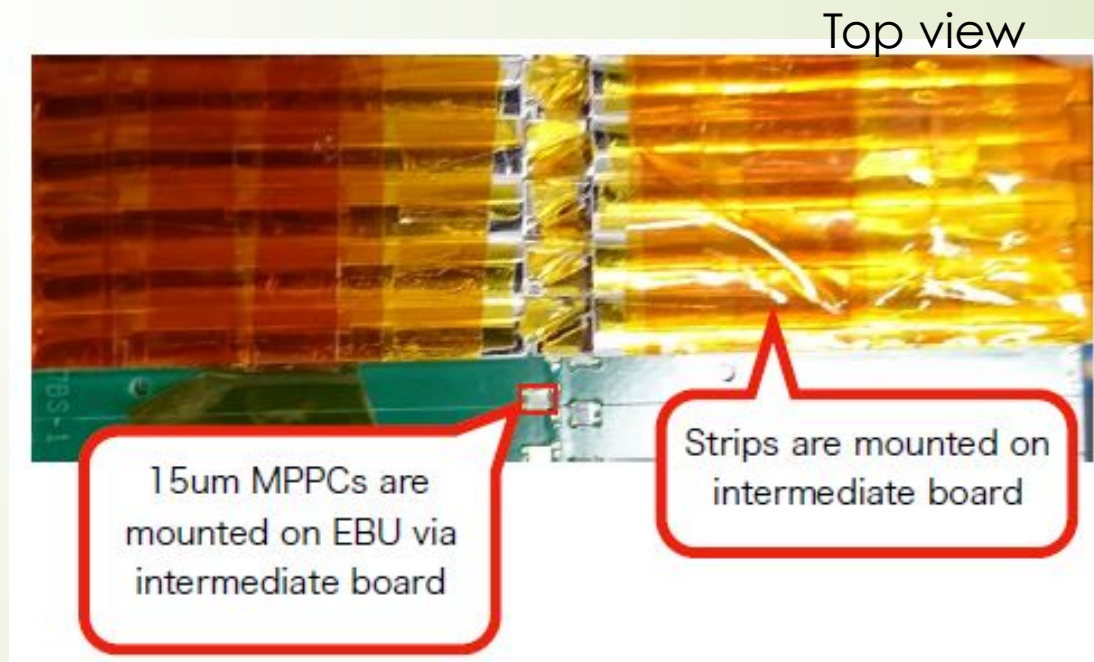
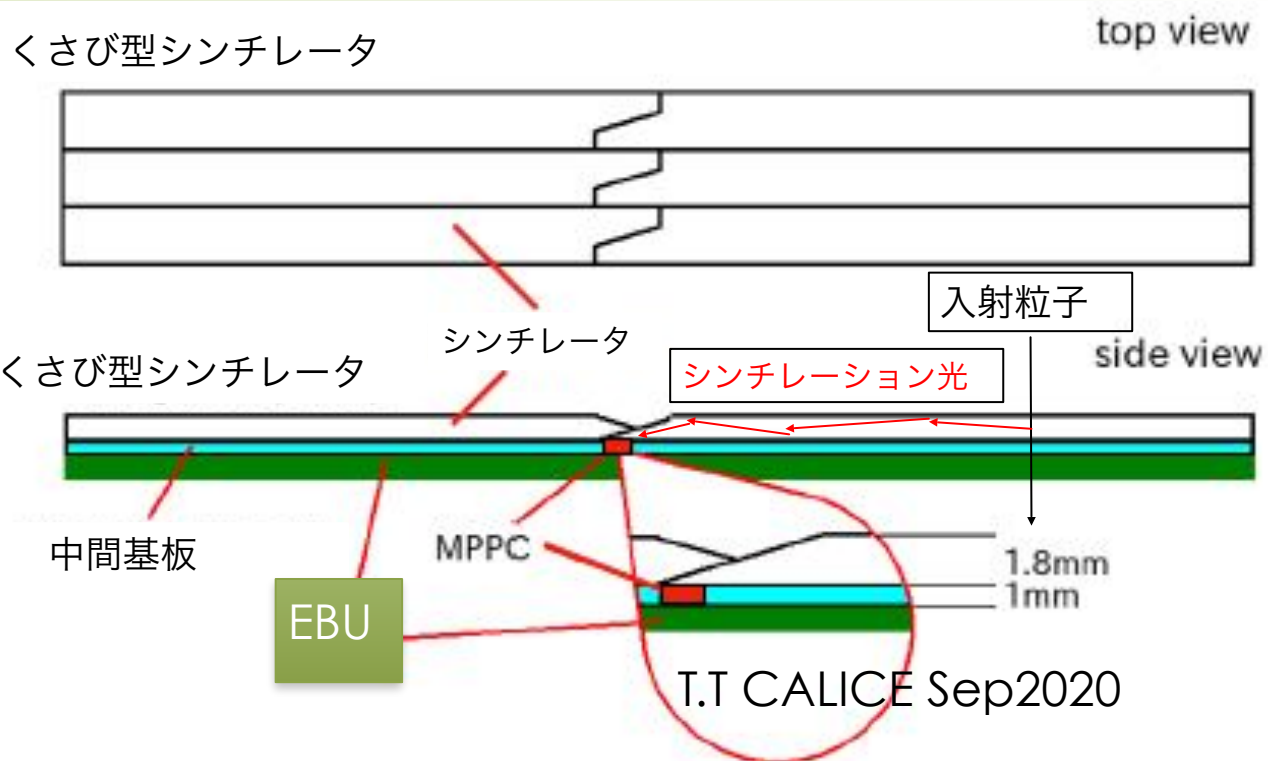
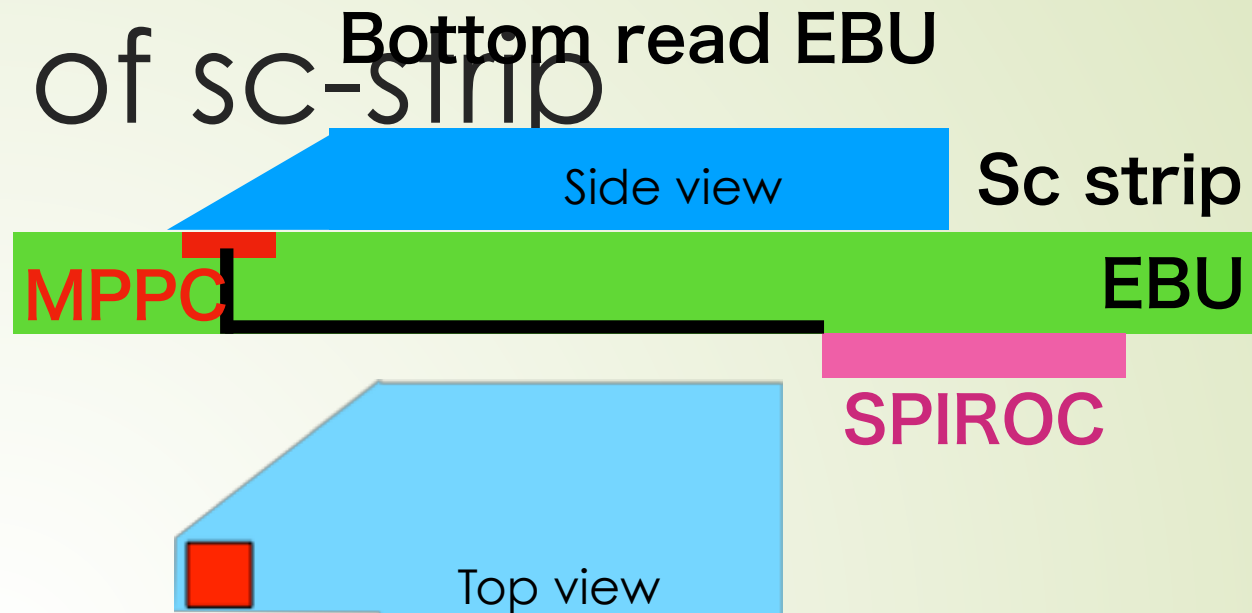
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Bottom read out of sc-strip

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No dead volume in the scintillator plane
 Better uniformity of response along the length
 (than side read out)

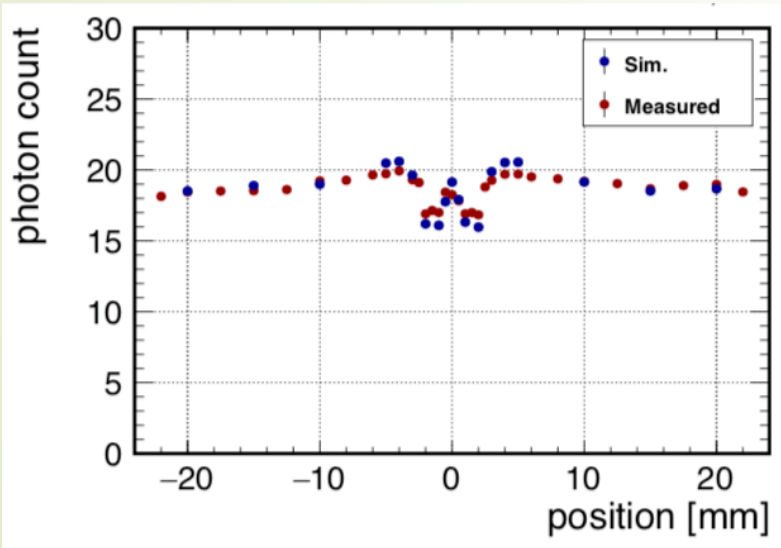
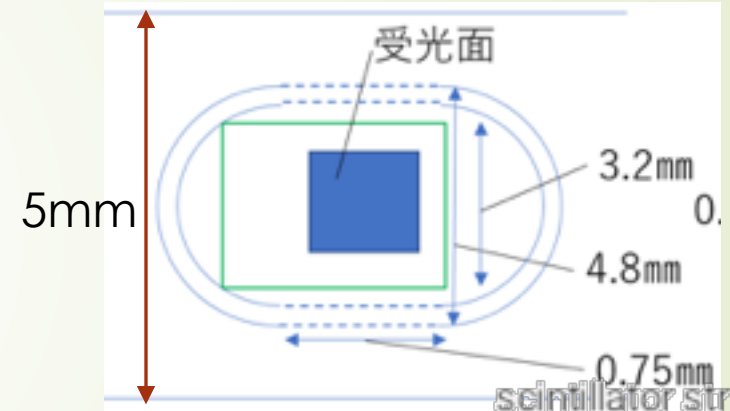
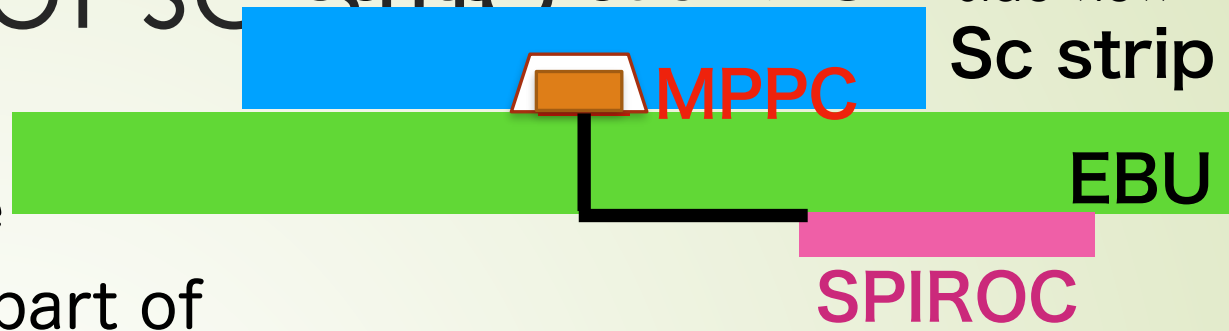


Center read out of scintillator

Side view
Sc strip

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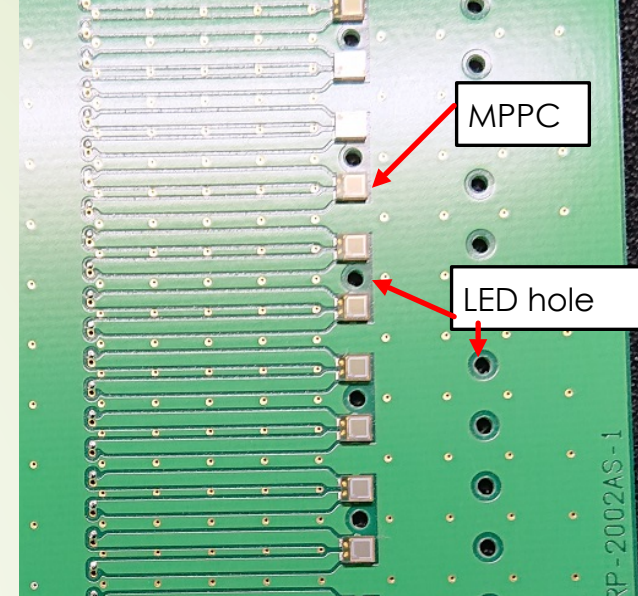
- A dimple at center of a strip
- A dimple with race track shape
- Surface treatment of the roof part of the dimple is important to get good linearity
- Systematic study is in progress



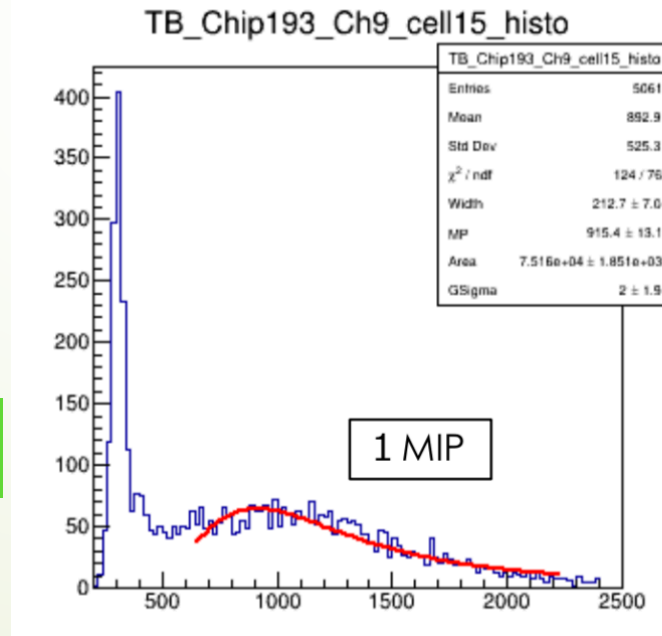
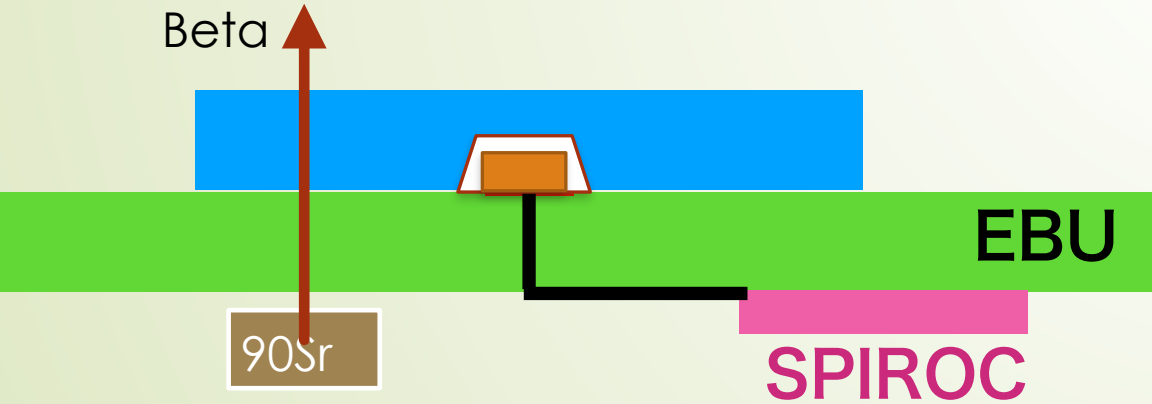
EBU readiness

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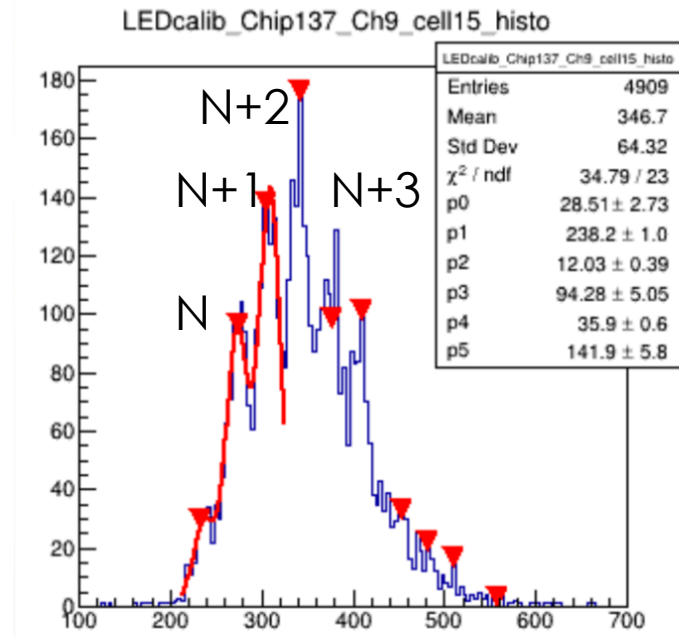
- LED calibration : detect photo-electron peaks and gain stability can be monitored
- MIP calibration: absolute gain : before installing the detector



ADC distribution



ADC counts



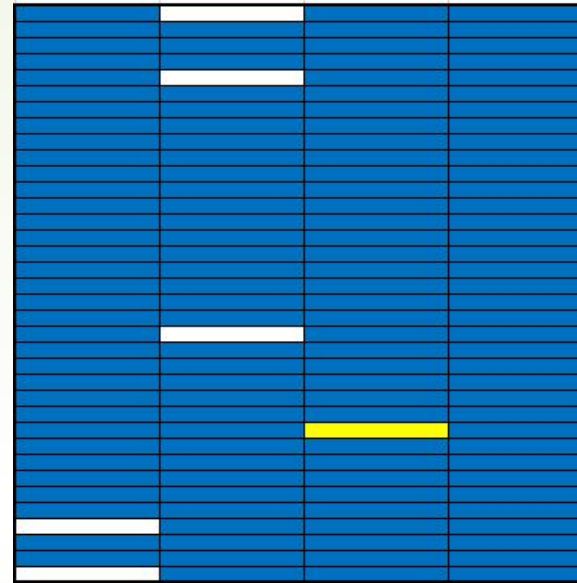
ADC counts

EBU readiness : current status

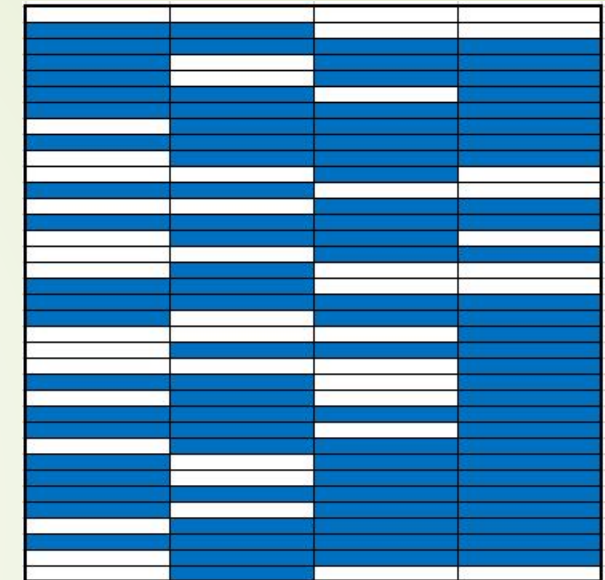
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- Bottom readout EBU
 - MIP 138/144 (96%)
 - LED 98/144 (68%)
- Center readout EBU
 - MIP 106/144 (74%)
 - LED 87/144 (60%)
- Need more effort to finish Calibration

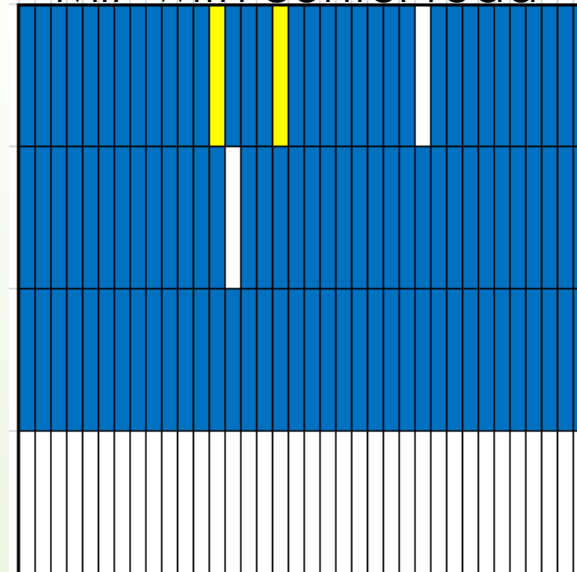
MIP with bottom read



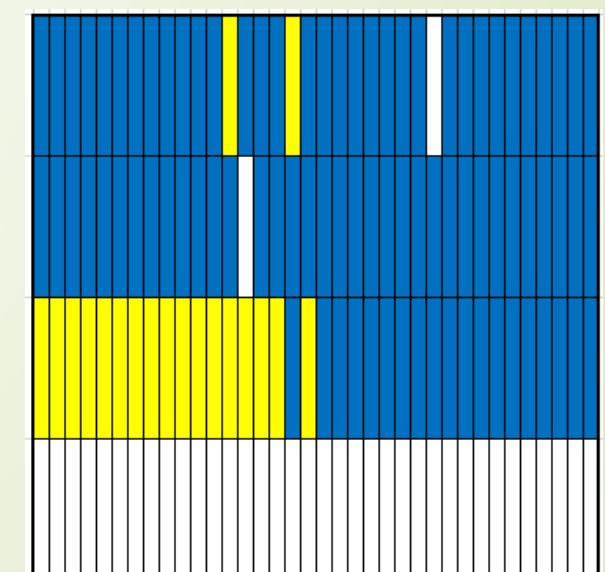
LED with bottom read



MIP with center read



LED with center read

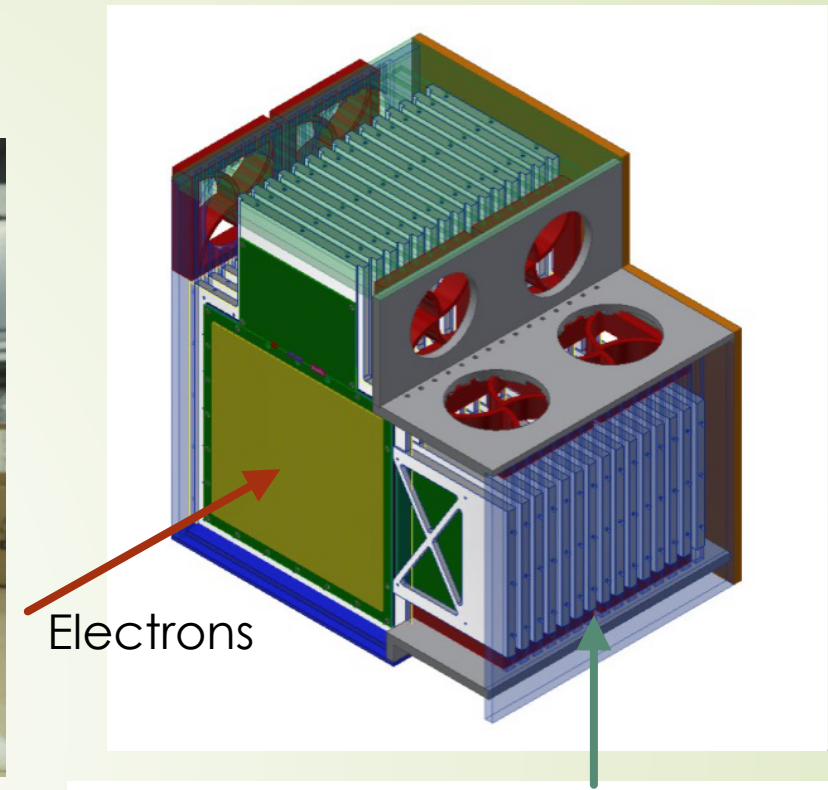
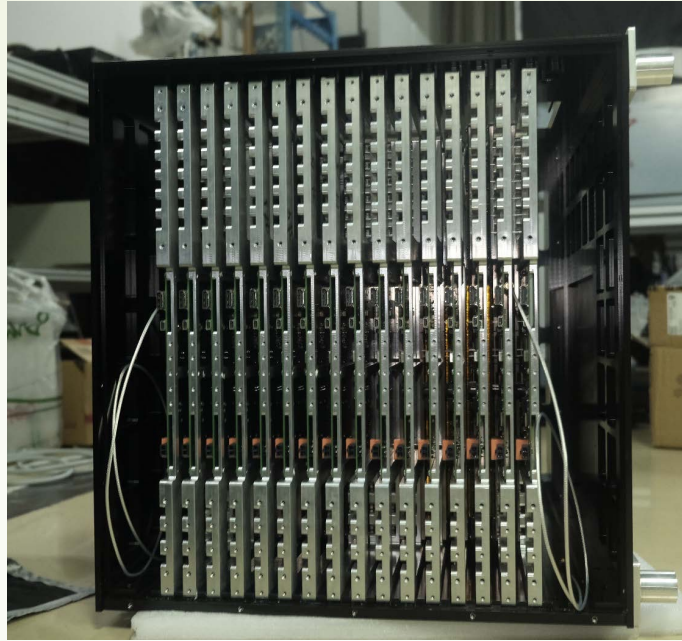


Scecal beam test at DESY

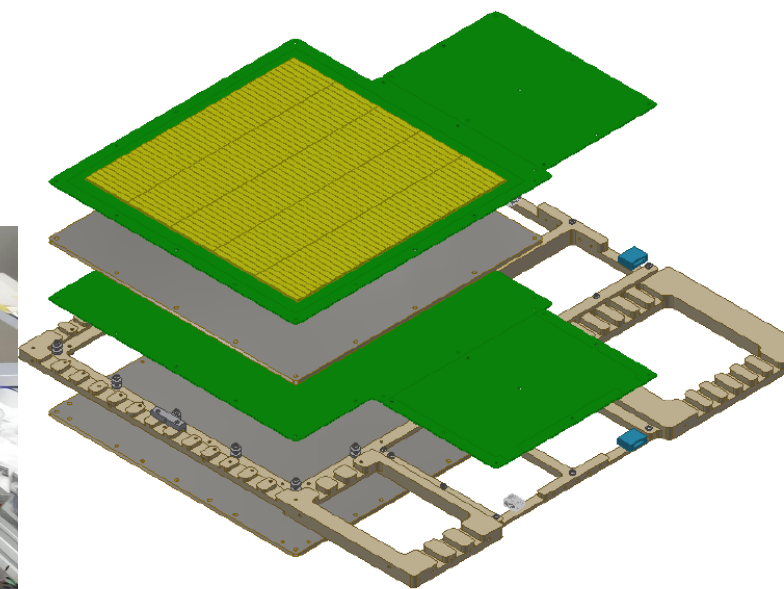
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Feb 2021

- 34 layers of scecal
- 30 : China (center read with 10+15 μm pitch MPPC) USTC+IHEP
- 2: ICEPP (double read with 15 μm)
- 2: Shinshu (center and bottom read with 15 μm)
- All fabricated



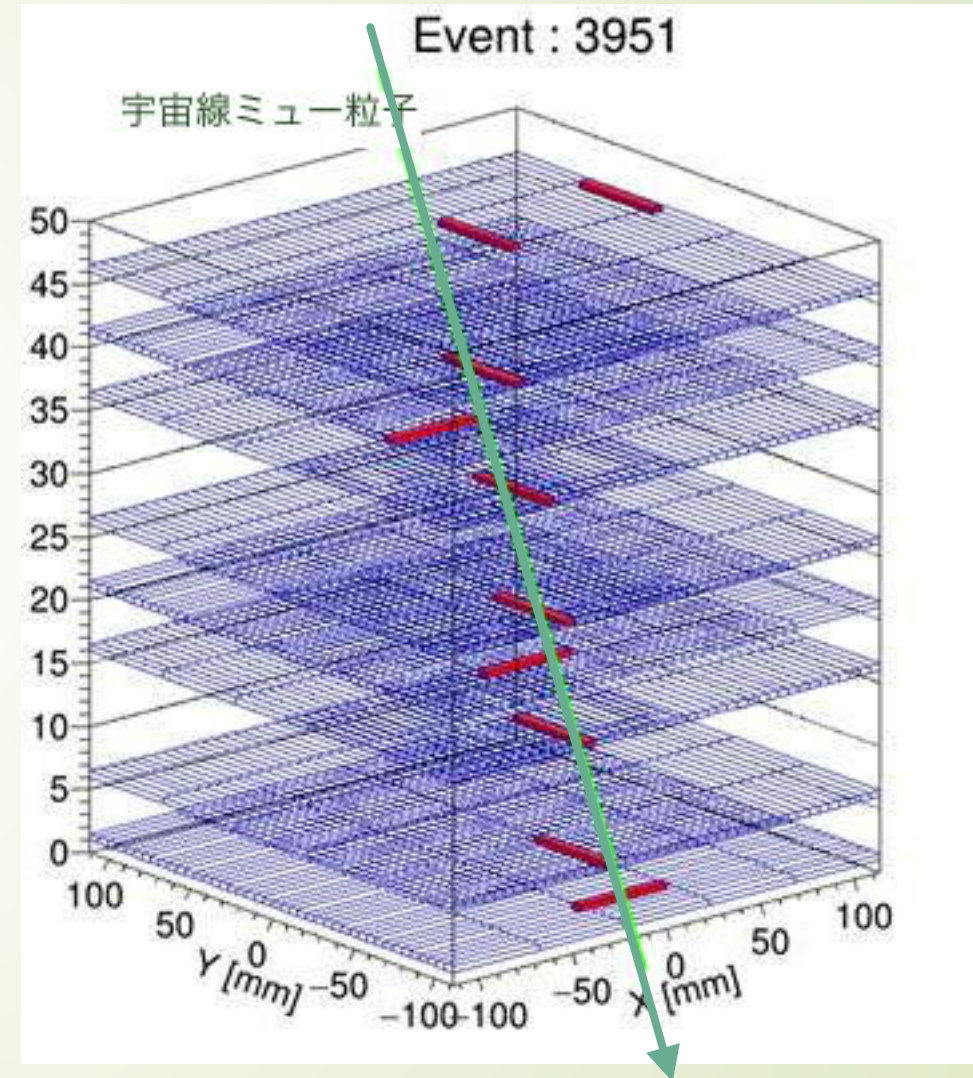
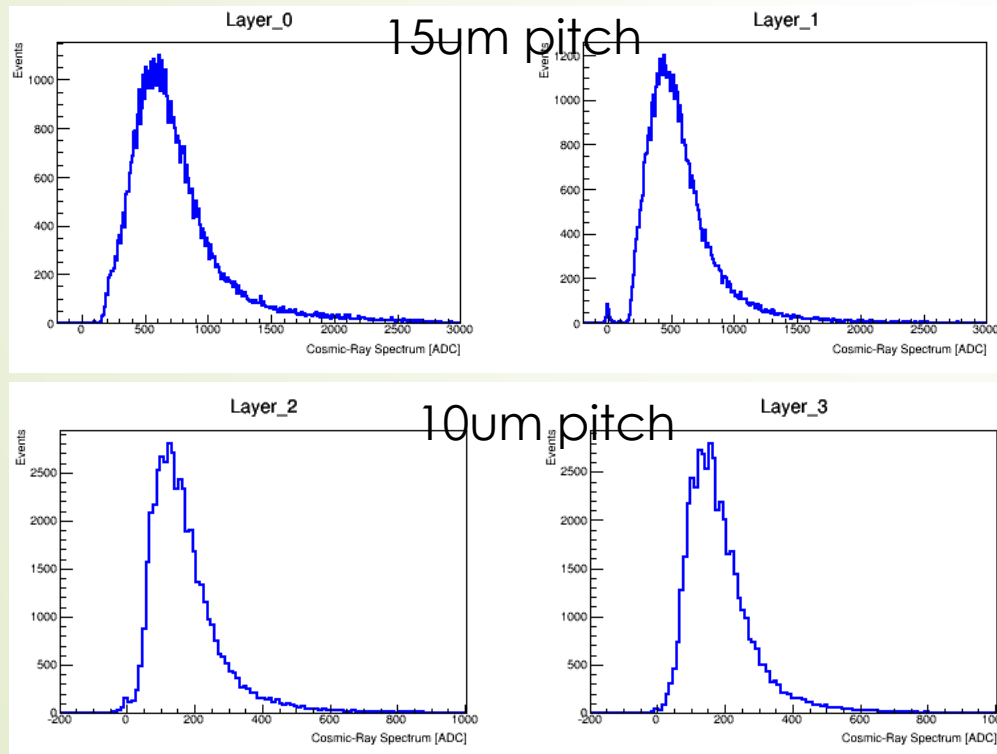
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Scecal cosmic ray test at USTC

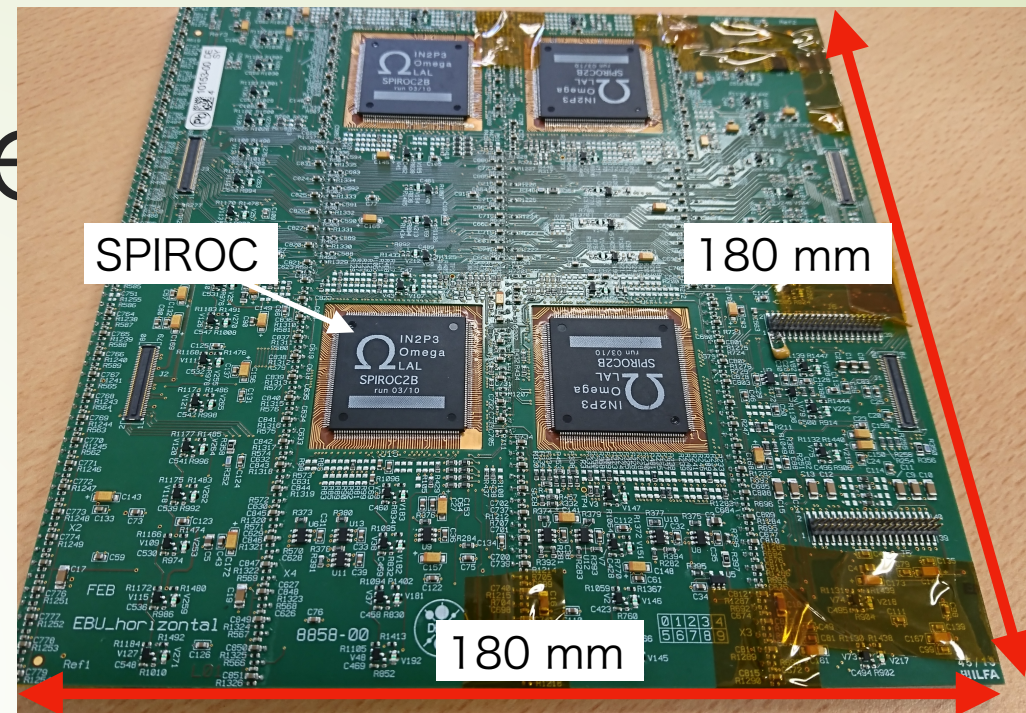
- Cosmic ray test
 - 10 layers with self trigger
 - 32 layers with ICEPP cosmic trigger settings in progress

ADC dist.



Scecal beam te

- With ICEPP, USTC & IHEP
- Shinshu contributes with 2 layers
 - Bottom read out layer
 - Center read out layer
 - Tuning and calibration are on going
- Feb2021 at DESY



Summary and outlook

- ▶ Shinshu is preparing two EBUs with bottom and center read out strips for the beam test
 - ▶ Fabrication is finished
 - ▶ Calibration with LED and Beta rays is in progress
- ▶ Cosmic ray test is expected in November
- ▶ Joint beam test at DESY with Chinese group (USTC and IHEP) and ICEPP will be carried out Feb2021